THE USE OF ALTERNATIVE MEDIA FOR TALKING BOOKS

C Friedlander

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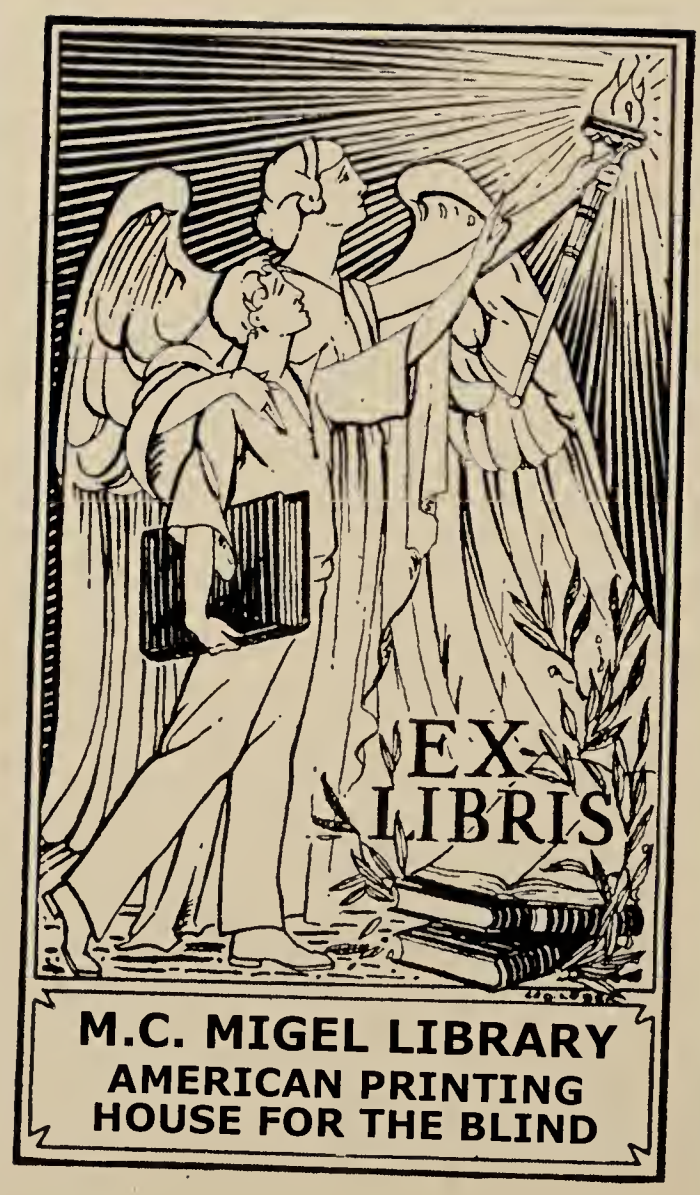
Technical Development Report No. 1

RNIB



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Technical Development Department

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This report is designed to present a summary discussions at the Symposium on Audio Technology held as part of the IFLA-SLB Expert meeting in Tokyo during August 1986. Also included, are details of work carried out by RNIB on alternative media, along with a general update on the state of digital audio systems.

Without doubt, most of the Talking Book systems in use throughout the world make use of audio recordings on magnetic media, in one form or another. RNIB is no exception, having evolved from long playing gramophone records in the 1930s, to the present Clarke & Smith multitrack tape cassette which has been in use for nearly twenty years.

Although many libraries have no need to change from their present systems, the situation at RNIB is a little different. In view of the age and technical limitations of the Clarke & Smith system, serious consideration is being given to exploring a more advanced alternative.

After the IFLA - SLB Expert Meeting, informal talks were held with representatives of Sony and Akai while in Japan, to discuss digital systems for use in possible future Talking Books. This was in addition to the work already done at RNIB to investigate Compact Disc and 8mm video. Although these meetings provided valuable input, the production of this report was delayed to allow information gained at a recent conference on digital audio, held in London, to be incorporated. The speed at which progress in this field is being made is quite alarming. Much clearer information is now emerging concerning the possibilities and pitfalls of some of the digital systems.

An attempt will be made, in the following pages, to outline some of the possible digital alternatives to conventional audio recording. Also included are summary notes of the meetings in Tokyo. It is virtually impossible to describe digital recording systems without using technical terms, therefore the notes that follow will outline the process in a highly simplified manner.

In a conventional audio recording system you don't get out what you put in! Magnetic tape suffers from signal degradation due to distortion, noise and physical tape defects. The medium itself is also vulnerable to physical damage and deterioration with long term storage. Subsequent copying of recordings further degrades the signal quality.

In a digital system, the medium is used to carry binary data which exists in only two states, on or off. This type of signal is very easy to record and reproduce and can suffer all kinds of abuse in the process. In essence we need to take an analogue source and turn it into a collection of binary digits which can be stored easily. All copying and distribution is done in the digital domain. When we wish to listen to the recording, the stream of digits must be converted back to an analogue signal.

In converting the input audio signal to a digital pulse train, the generic term is PCM, which stands for Pulse Code Modulation. There are several forms of PCM which involve the use of linear or non-linear laws. A particularly useful form is Adaptive Delta PCM, or ADPCM for short. This is a very efficient method of coding which is able to adapt to the dynamic range of the input signal very quickly. Redundant information is not coded which results in very compact storage requirements.

The number of bits refers to the resolution of the coding. The term sampling rate implies the speed at which the input information is coded into digital form. Theory dictates that in order to faithfully recreate a particular frequency, it must be sampled at slightly more than twice that frequency.

In order to allow storage on magnetic or optical media, digital systems incorporate complex systems of error correction. These are able to recreate consistent data from interleaved samples in the event of minor corruption of the stored data. The commonest form of error correction is that used in the audio Compact Disc, called CIRC. For the inquisitive, this stands for "Cross Interleave Reed-Solomon Code" and encompasses some quite clever mathematics.

It must be stressed that this is a gross simplification of some really quite complex technology, but may assist those readers with no real knowledge of digital audio.

U.K. User Profile

Our users are best described as falling into two distinct groups. The largest group is typified by the 73 year old female reader, indicated by the statistical average of the present membership. Young people and students form a somewhat different user group.

It should be noted that the vast majority of users seem content with the existing Clarke & Smith system and that any change to new technology must offer real practical advantages. It is acknowledged that we may not be getting an accurate response due to the poor feedback from most users.

Symposium on Audio Technology

This was held on 21st August 1986 in the Shinjuku New City Hotel. Its purpose was to hear from representatives of the Japanese audio industry concerning new developments. Delegates also had the opportunity to outline the operation and future plans of their own Talking Book systems.

The meeting was attended by the following representatives of the Japanese audio industry.

Kiyomoto Shirai	Electronic Industries Association of Japan.
Kanji Odagi	CD System Development Manager with Matsushita Electric.

Kiyomoto Shirai told the meeting that he was impressed with the quality and quantity of research being done into new systems. Mr. Shirai was aware of the work done by Philips concerning long play CD. The need for international discussion on CD development was stressed.

When considering CD as a medium for future Talking Books, Mr. Shirai made these comments:- Long playing times are possible, 8 hours of music in stereo, or more than 16 hours of mono speech. Automatic autochange facilities could be incorporated. Machines would have to be designed for easy maintenance. To reduce operating costs, masters could be stored in a central library.

Although industrial recordable CD exists, it is not seen as a low cost domestic product. Most effort has been directed into CD-ROM applications. CD-ROM costs were given as 300,000 Yen (About £1300) to produce a master and 1,000 Yen (About £4.45) for each copy.

The proposed standards for Interactive Compact Disc (CDI) are likely to be agreed upon around the end of 1986. Audio applications for CDI have taken second place to that of data. Mr. Shirai saw a development potential for CDI format books.

Kanji Odagi of Matsushita then explained his involvement in the original work on PCM tape recorders using a digital processor with a video recorder as a storage device. This is now considered as mature technology. Five years ago he did work on Digital Audio Tape recording. He is now concentrating on CDI. Mr. Odagi pointed out that DAT is very similar to CD in the way it stores data. He also pointed out that with tape, access is in serial form, whereas with CD it is random.

An outline of the proposed CDI standard was given. It was hinted that products using this format would be on the market within two years.

Mr. Odagi stated that high operating costs could be a disadvantage in the adoption of CD, particularly for small volume users. He also quoted a minimum of four weeks waiting time before CD plants can process work, due to high world demand for discs.

Visits to Sony and Akai

Sony

A meeting, and tour of the Sony Shibaura Video 8 production plant had been promised. The venue was subsequently changed to the Sony Corporate Headquarters in Shinagawa, where a meeting was held with the following:-

Takashi Kinoshita	Manager, Consumer Video Division.
Yoshihiko Iyama	Assistant Manager, Product Planning, Consumer Video Group.
Yoshiki Muro	European Sales Dept., International Sales Division, Video Group.

Most of the meeting was spent going over our requirements for a new Talking Book system, effectively repeating the information already given to Sony U.K. Contrary to indications given in the U.K., Sony have not done any design work or produced a prototype, or mock up. Nothing was exhibited at the IFLA exhibition. They offered to demonstrate a standard EV-S700 Video 8 machine, but RNIB had already evaluated one of these in the U.K.

After discussing our requirements, they promised to consider the matter and contact RNIB, through Sony U.K., within the next two months. A very cool reception was received, on mentioning an interest in RDAT. Sony were not prepared to discuss this in any detail. They have certainly done work in this field but are cautious who they let into their confidence.

After returning from Japan, talks took place with Mr. Hirano, Video 8 Product Manager. We discussed at length, the lack of cooperation on the part of Sony Japan. Mr. Hirano and his team have done some initial work on a possible adaptation of Video 8 players for our needs.

Akai

Akai have been looking into long playing CD applications for some time now. This was originally conceived for background music use. RNIB has been kept informed of these developments, on an informal basis, through Peter Wall of Akai U.K. We sent a sample text recording to Japan for Akai to experiment with, several months ago. The visit to Akai, in Ohta-ku, was arranged mainly as a social call.

A round table meeting was held with the following personnel:-

Takenobu Matsumura	Managing Director.
Takeshi Takano	Group Leader, Video Planning Group, Product Planning Dept.
Tadao Yano	Manager, Sales Dept., Devices & Special Equipment Division.
Shigeru Kimoto	2-Section, Assistant Manager, Technical Development Dept.
Toshihiko Nakagami	Assistant Manager, Technical Development Dept.
Shoichi Kawai	Manager, Corporate Strategic Planning Office.
Toru Ando	Manager, Advertising Dept.
Takatoshi Suzuki	Engineering Development Dept.

Much time was spent discussing the pros and cons of the present Clarke & Smith system, Compact Disc, Video 8 and RDAT. Akai seemed very aware of the implications of a system change to the RNIB and offered much constructive help when considering alternatives.

Compact Disc

Akai have developed their own long play CD format. This was done before the CDI standard was being formulated. The Akai format uses 8 bit ADPCM. The sampling frequency has been lowered by a factor of three. In mono, this gives a twelve fold increase in playing time i.e. 14 hours plus. A frequency response up to 6.6 kHz and signal to noise ratio in the region of 65dB is claimed.

Although the Akai method gives a shorter playing time and slightly inferior H.F. response, they claim that the CDI format generates inferior quantisation noise, due to the 4 bit coding used.

The high cost of CD was pointed out, yet again. Akai quoted internal costs of about £4 each to produce CD's in batches of 1000, including mastering. They confirmed that a figure of £1.50 was realistic for replication only (In line with past U.K. quotes from Nimbus).

The need for some form of disc protection was discussed and a caddy type container made by Yamaha was mentioned, at a cost of 600 Yen (About £2.70).

In view of the activity on CDI, Akai are uncertain of the future for their own format. If CDI is adopted as a standard, they might not pursue their special format any further.

A demonstration of the Akai format PCM encoder was given. This was used to play samples of the recording that we sent them. I was able to hear the comparisons between the direct signal, that through the 6.6kHz low pass filter and finally, that through the 8 bit ADPCM system. The subjective quality of the ADPCM is very good indeed, both on male and female voices. It was very obvious that the use of just over 6kHz as a cutoff point was well chosen.

Akai echoed comments made by others in Japan, to the effect that the market penetration of CD is increasing there. They said that CD is enjoying sales equal to vinyl disc in Japan and that some classical releases are on CD only.

Video 8

Akai have not been looking for non standard applications of Video 8 and therefore see this in terms of the normal consumer type equipment. Although they agree that its use as a carrier for audio has advantages in terms of storage and quality, they did point out that as this is a domestic video product its future was not guaranteed. The video markets are subject to many changes and Video 8, as a new format, has still to establish a real foothold. The need to extensively modify or redesign a special product was not attractive to them.

DAT

Akai have done initial development work on RDAT, as have most of the major manufacturers. No specific products were available for demonstration at the time although prototype hardware was to be exhibited at the forthcoming consumer electronics fair in Japan.

After discussing these alternative media, Akai offered the following advice. It is imperative to wait until the CDI format has been settled, around the end of 1986. This will dictate whether the Akai special CD format has any future. Although CDI could be a viable system, the matter of cost and small volume requirements must be seriously considered. Although the technical development has been done for RDAT, it will take about 2 years to produce the necessary LSI and final product design, assuming freedom to market it.

Akai hinted that if RNIB can retain its present system until commercial products are marketed using the new digital systems, it would avoid making expensive mistakes, or choosing a system with a short life.

Back in the U.K., following subsequent progress on the CDI front, Akai U.K. are consulting with Japan. There may well be merit in the Akai format if the 4 bit CDI proposal is considered unacceptable.

Alternative Systems

What follows is a general outline of some of the main areas of technology that seem appropriate to bear in mind when contemplating a new system for Talking Books. It also allows me to update some of the information presented in Tokyo and include subsequent developments.

Compact Cassette

This medium is included to complete the list of options. It is in wide use and offers advantages in cost and storage capacity. The Library of Congress half speed four track format offers up to six hours playing time on a C90 cassette. The audio quality is adequate for speech, although of a much lower standard than full speed compact cassette.

The four track format requires a specially built player, which can be difficult to source outside the United States. RNIB has this format on its list of options, ready for when our eventual choice has to be made.

Compact Disc

This will be dealt with under two headings :- CD-DA, the conventional CD used for audio and CDI, the Interactive Compact Disc.

CD-DA

The music CD is now a firmly established medium for high quality sound reproduction. From the beginning, RNIB saw the potential in developing this carrier into a long playing Talking Book.

Early experiments, conducted on our behalf by Philips in Eindhoven, produced a prototype 12 hour Compact Disc and modified player. This CD had full 16 bit linear coding and divided the normal sampling frequency of 44.1kHz by a factor of five. This resulted in a high frequency response extending to barely 4kHz. As mono sound only was required, the two channels of the original stereo format were used to carry different material. The dividing factor then became 10, which coupled with a maximum disc playing time of 72 minutes, gave the resulting 12 hour capacity. This procedure is known as Time Division Multiplexing and is in common use in the telecommunications industry.

We were of the opinion that this choice was favouring excessive dynamic range at the expense of frequency response. We later proposed the use of non linear coding, using 8 bits, in order to restore the balance.

It was apparent that the use of non standard CD formats was not attractive to the manufacturers and therefore little progress was made. It is certainly possible to produce a long playing version of the conventional CD as a technical exercise, but to persuade anyone to manufacture it is another matter.

CDI

For some time now, there has been the possibility of using the CD as a storage medium for computer data. This takes the form of CD ROM, a type of read only memory holding in excess of half a gigabyte of information. Other systems encompassing recordable media of various sizes also exist, often called WORM discs (Write Once, Read Many). The publishing world is starting to make use of this technology for large scale text sources.

The CDI concept evolved from the CD ROM. The idea is to allow the disc to carry a mixture of picture, data and sound information. There is a full set of technical parameters for CDI published in a so called "Green Book" standard. Unfortunately, this is only released to potential licencees in return for a fee. Sufficient information does exist to allow the potential of the medium to be assessed.

The CDI disc can contain audio and video data in varying proportions. As we are not particularly interested in video, I will outline the audio applications.

There are several standards of audio coding available as follows:-

1) Full Hi-Fi CD audio standard as on a normal CD. This uses 16 bit linear PCM encoding at a sampling frequency of 44.1kHz to give a playing time of nominally 1 hour in stereo (72 minutes absolute maximum). The upper frequency limit is 20kHz and dynamic range is 96dB.

2) Hi-Fi mode A, equivalent to LP records. This uses 8 bit Adaptive Delta Pulse Code Modulation (ADPCM) encoding at a sampling frequency of 37.8kHz. Nominal playing times become 2 hours stereo or 4 hours mono. The upper frequency limit is 17kHz.

3) Hi-Fi mode b, equivalent to FM radio. This uses 4 bit ADPCM encoding at a sampling frequency of 37.8kHz. Nominal playing times are 4 hours stereo or 8 hours mono. The upper frequency limit remains at 17kHz.

4) Quality Speech Mode, equivalent to good AM radio. This uses 4 bit ADPCM encoding at a sampling frequency of 18.9kHz. Nominal playing times become 8 hours stereo or 16 hours mono. The upper frequency limit is reduced to 8.5kHz.

5) Phonetic Speech Mode. It is possible to store speech phonemes on the disc to allow for very long playing times indeed. Quality is rather poor, as one would expect.

This family of encoding standards holds interesting potential for long playing Talking Books. Option 4, the Quality Speech Mode would seem the most appropriate format for consideration. Incidentally, the analogies to FM, AM and discs are those of the manufacturers, not ours!

You will note that dynamic ranges haven't been quoted for the ADPCM coded options. Due to the sliding nature of ADPCM coding, a fixed noise corridor is moved up and down to chase the input signal. Instantaneous signal to noise ratio is then the preferred term. Using level 4 coding, a figure of around 50dB has been quoted, with pre-emphasis on. Noise therefore becomes a matter of subjective evaluation. It should be noted that at the time of writing we have not heard samples of 4 bit coding. We have heard examples of 8 bit ADPCM which were quite outstanding.

The data format used for CDI is different from the form used for CD audio discs. An audio CD starts life as a PCM master tape, recorded on a U-Matic video cassette. The audio data is converted to digital information superimposed within a standard television waveform. The industry standard hardware to do this is the Sony PCM1610 or PCM1630 Digital Audio Processor.

At present, CDI discs are mastered using computer based systems which are able to store and rearrange the raw audio and video data into a suitable format. As the use of CDI as a fully audio based medium is relatively new, the practical methods of data preparation are still to be finalised. Such systems will probably be an extension of the technology used in present devices such as the A.M.S. Audiofile or Synclavier and other similar sound storage and manipulation devices.

Once the glass master disc has been prepared, replication by means of injection moulding is the same as for audio CD's. The conventional method of glass mastering involves the use of a Laser Beam Recorder. It has been reported that Teldec in Germany have produced a CD master lathe using a derivative of the Direct Metal Mastering process.

In order to play the resulting disc, a special CDI player is used. This is similar to an audio CD player, except for the inclusion of some extra processing electronics to handle the decoding of the various formats. The gate array chips already exist to do this. A full CDI player also contains a microprocessor with a fair amount of inbuilt computing power.

An audio CDI player for use by the blind is envisaged as a basic CD transport along with the minimum electronics required to decode audio only. A simplified set of controls would be needed, suitable for operation by the user. The use of an infra-red remote control unit would enable the operating controls to be easily adapted for those with multiple handicaps, or even to allow retrospective design changes to be made easily.

In order to access a 16 hour plus recording, the player runs through a normal length track at a time. At the end of the first track, the scanning head is moved back to the start of the second track etc. In this way, all tracks are played in serial fashion without intervention from the listener. The time taken to switch tracks depends on the design of the player mechanism, but should be in the range 1 to 3 seconds. The use of the various index markers inherent in the CD format would allow true random access to a very large number of points in the recording. Some form of non-volatile memory would need to be used to store the location of the point on the disc at which the reader stopped listening. Subsequent listening sessions would then be able to resume at the same point in the text. This function is of course a simple physical memory, in the case of conventional magnetic tape.

8mm Video

This is a relatively recent addition to the ranks of domestic video formats. The point of interest lies in its sound carrying possibilities.

There are two basic types of Video 8 machine. The first is like a conventional machine in that it offers two channels of sound, along with the picture recording. In order to offer Hi-Fi sound, a form of digital recording is used. The second type of machine allows the area of the tape normally used to store the picture information, to carry additional sound channels instead. We thus have, in effect, a multichannel PCM tape recorder.

These products are available off the shelf in high street stores, unlike many of the newest technology systems. The small video cassette can be used at two speeds, either of which are applicable to the multitrack audio mode. Six stereo tracks of audio are provided. Frequency response extends to between 14 and 15kHz, with a dynamic range approaching 80dB. Each stereo track can be accessed and recorded individually. Playing time, using a P5-60 PAL standard cassette at slow speed, is 2 hours per track. We thus have 12 hours of stereo available.

There are several options available concerning playing time. These include the use of P6-120 2 hour cassettes, at fast speed, under the NTSC television standard. This has the advantage of better data security due to the faster tape speed.

Video 8, being a tape based system, cannot offer rapid random access. One fundamental problem lies in the fact that the cassette must rewind to the start to play each track. On the Sony EVS-700 machine this takes about four minutes! A form of index search could be incorporated, working at 26 times play speed, according to Sony. As far as duplication is concerned, all six audio tracks are considered as one piece of information. In the video world, real time duplication is the norm i.e. a P6-120 cassette would take 2 hours to copy. Multiple banks of linked video recorders are usually used. A high speed copier has been developed for video use nicknamed the "Sprinter". This makes use of a form of contact printing at, it is rumoured, 70 times normal play speed.

Digital Audio Tape

This term covers two basic types of recorder dedicated to audio. This is an alternative to those systems which use a basic video waveform in which to carry audio PCM data. The terms SDAT and RDAT are used, which stand for Stationary head Digital Audio Tape recorder and Rotary head Digital Audio Tape recorder respectively. SDAT machines are commonly said to be of DASH format (Digital Audio Stationary Head).

SDAT

SDAT, or DASH machines use a conventional tape transport running at a fast speed to carry digital data, recorded on several parallel tracks. This is necessary to allow data to be interleaved across the tape, in order to provide a mechanism for error correction. There is a half speed mode also available on machines called Twin DASH.

So far, these machines have been limited to the professional market on cost grounds. As an example, a 24 channel Sony machine costs about £90,000 and a 2 channel stereo from the same source, about £20,000.

RDAT

RDAT machines make use of video recorder technology in order to reduce the tape speed and miniaturize the design. A great deal of speculation and misinformation exists on the subject of RDAT. The development is not new, but has been held aside due to market pressure. We have only recently come into posession of seemingly reliable data on RDAT. A series of specifications exist, covering several formats, which contain large sections marked 'tentatively specified for experiments and feasibility studies'. An RDAT cassette was shown at the IFLA SLB meeting in Tokyo, but little additional information was given.

The cassette measures 72mm x 54mm x 10mm and contains approximately 60 metres of 3.81mm wide metal particle tape. The tape is normally run at a linear speed of 8.15mm/second which gives a 2 hour playing time. Recording is done in a helical scan mode, similar to video. Adjacent scan tracks are not provided with a guard band, therefore a form of automatic track following system is used.

The full physical data on the system will not be presented here as it is of a highly technical nature, and not strictly relevant to this discussion. Within the scope of the RDAT specifications, no less than 6 formats are described. These are modes 1, 2, 3, 4, 1TP and 1.5TP. These modes were proposed with different purposes in mind. Several items in the technical specifications change with each mode, such as drum speed, encoding standard and tape speed. Some important differences are summarised below.

Parameter	Mode 1	Mode 2	Mode 3	Mode 4	Mode 1TP	Mode 1.5TP
Tape Speed (mm/S)	8.15	8.15	4.075	8.15	8.15	12.225
Track Pitch (uM)	:----------13.591----------:					20.41
Quantization Law (Bit)	:--16 Linear--:		:-12 Non Lin-:		:----16 Linear-----:	
Sample Frequency (kHz)	48.0	:--------32.0--------:			:-------44.1-------:	
Audio Channels	:---------2----------:		4		:---------2--------:	

The Mode 1 and 2 formats are intended for systems working to professional standards, where 32 and 48kHz sampling is in common use. Modes 3 and 4 are very tentative at present. The TP modes are the only ones that share the 44.1kHz sampling frequency used for normal audio CD.

In order for the contact printing method of duplication to work, mode 1.5TP was proposed. The wider track pitch and higher tape speed helps the process. It is these formats that are the greatest cause for concern among those who fear piracy. It would not be difficult for direct digital copying of commercial Compact Discs to be done onto RDAT cassettes, with no quality losses.

A Sony prototype portable stereo RDAT recorder, aimed at the professional user, has been exhibited in London. Several manufacturers exhibited prototype machines at the recent Consumer Audio Fair in Tokyo. Until the format stabilizes, the exact form that RDAT will emerge in is unclear. There has been much talk of it taking over from the compact cassette or threatening the use of analogue tape machines in professional circles.

There are no satisfactory editing methods available yet for this format, contrary to the original publicity claims. Normal video recorders have a control track recorded in addition to the helical scan video tracks. This allows the editing control circuits to know where they are in relation to the recorded information on the video tracks. The RDAT formats contain no control track. Automatic track following data is recorded along the helical scan tracks, to keep the system operating correctly. In an edit situation, this information is erased when the new material is recorded. This is fine for sequential butt jointing, but the momentary audio glitch produced makes serious editing impossible.

The possibility of recording SPMTE/EBU format timecode along with the PCM data would make professional editing possible. At present, little work has been done in this area, although it will certainly arrive before long. The Sony prototype was equipped for timecode but it is not known if any editor exists yet.

Duplication of RDAT cassettes to the 1.5TP format can be done using the Sprinter technique previously mentioned. We understand that Sony have a laboratory prototype copier that is running at 300 times.

Laser Cards

Methods exist to optically encode digital data on plastic cards, similar to a credit card. Data can be written by the user, with a laser. A similar method is used to read the card.

Such cards are being used to hold medical information in the U.S.A. or other data applications in other countries. The present storage capacity is in the region of 2 Megabits which is totally inadequate for the known forms of audio data storage. We can thus pass this option by, although it will be interesting to see how the storage capacity increases in the next decade.

Solid State Memory

Digital audio data can be stored and manipulated in computer memory. The present limits of memory chip technology impose an unacceptable package count to give the hundreds of Megabytes required. The concept of a book on a chip is rather far fetched at present.

Disc based Memory

There are several systems that offer varying lengths of storage. These all make use of massive Winchester disc drives to store the digital audio data. Although such systems would be useful as part of a mastering or editing process, cost and size preclude their use as a consumer medium for reproduction.

Summary

In choosing a new system, cost is a very important factor. Conventional magnetic tape media scores heavily here. It would be foolish to suggest that any small Talking Book operation could make effective use of the options presented here. In a large service such as ours, the numbers involved become more realistic. A point worth mentioning is that in the RNIB recreational library, the average length of a recorded book is between 11 and 12 hours. This figure is an important factor when considering an alternative to our present Clarke & Smith 12 hour cassette. On the basis of current information, we would offer the following comments on the major contenders.

Compact Cassette

In order to reduce tape consumption, the 4 track half speed format would seem to be the logical one to choose. In our situation, this would imply 2 cassettes per average title. The system is well proven, but suffers from some technical shortcomings. Random access indexing is not possible. Tapes are easily subject to physical damage. Duplication can be done on copiers intended for normal stereo use although several makes suffer from unacceptable crosstalk between channels in the 4 track mode. Sufficient equipment does exist that will do an adequate job. This format requires the use of a special playback machine. Although such machines are available from overseas sources, supplies and support in the U.K. are not easy to obtain.

Some material is being produced by the RNIB Student Tape Library in 4 track format. We therefore have some practical experience in this system which could be applied on a much larger scale if required.

Compact Disc

In our early investigations into extended CD playing time, we reached the stage that we knew that it could be achieved. Lack of interest on the part of manufacturers was disappointing. It comes as a pleasant surprise to see the release of the long play audio format specifications. This would be the obvious route to take in persuing CD.

The retail price of CD players has dropped dramatically since we first considered this option. A more revealing guide to the true cost of a CD player mechanism to the O.E.M. user, can be found in the low retail cost of complete music centres containing a CD player. Disc manufacturing costs have also dropped, due to increased production throughput on modern plants. In large scale commercial production, it is rumoured that the basic cost of a CD pressing is now on a par with that of vinyl records.

By taking a basic player mechanism, it should be possible to produce a machine suitable for use by the blind. It would contain the basic audio decoding circuitry to enable CDI format sound playback. The basic CD can be encoded with a multitude of special data. This would enable precise place finding or copy security prevention to be incorporated. Subject to practical evaluation, the use of a protective carrier for the CD, to ease handling, would seem to be essential. The improvements in audio quality should ease listening fatigue, particularly for those with hearing defects.

The method used to produce the glass master for a CDI disc is a little inconvenient at present. Perhaps the biggest disadvantage to CD is the fact that low volume pressing of discs is not attractive to CD plant owners. Commercial runs of 200,000 for popular and 10,000 for classical have been quoted by one U.K. plant by way of example. At present, due to a phenomenal world demand for CD, pressing plants and mastering facilities are working to full capacity. In spite of this, pressing runs in the very low hundreds have been quoted as being possible. When the pressure is off the plants for increased capacity, there is very likely to be a surplus situation.

A rather bold alternative would be to consider an in house CD plant. The cost of doing this could be very high. Even with the possibility of selling capacity to the commercial market, this isn't particularly attractive. We would therefore have to rely on outside production of master discs and replication. There are plenty of sources that can produce CD though, so it is hardly a single supply situation.

A few months ago, CD seemed to look less attractive, now the situation may be reversing.

8mm Video

Of all the systems examined so far, Video 8 offers the highest quality sound in a long playing format. It is true to say that the medium is better than our master tapes! The use of a cassette with 6 tracks of 2 hours is attractive to RNIB because it exactly matches the format used on thousands of our master tapes. We realise that this is not true for other users, but it would make the job of format conversion much easier for RNIB.

There are major potential problems in adopting Video 8. Although many manufacturers are signatories to the Video 8 standard, most are making a living by producing VHS or other format video products. Sony are putting considerable effort into promoting a format that they have invested heavily in. It is difficult to predict the market stability of Video 8 over the coming years. Independent reports suggest that as a video system it is not without problems.

Sony is keen to promote Video 8 to us, in spite of the rather negative impression given in Japan. Although many design details for a suitable player still need to be discussed in greater detail, Sony are indicating their willingness to produce a prototype product.

Duplication would have to be handled either by banks of machines operating in real time i.e. 2 hours to copy a 12 hour tape, or at high speed using the contact printing method. The former method does allow for small copying runs as well as large ones. The cost of 8mm video cassettes isn't cheap at present although a much lower price would apply for bulk purchase.

Using Video 8, it is possible to record and duplicate ones own material relatively easily. RNIB has very serious reservations about the use of what is basically a video recorder mechanism, as a Talking Book machine in a home environment. One other potential problem is in the time taken to wind the cassette back to play successive tracks. We remain to be convinced that this would be a good system to use.

Digital Audio Tape

It is pretty safe to rule out the DASH formats and concentrate on RDAT. It is unfortunate that so much incorrect information was put about. We feel sure that when the editing problem is solved, RDAT will offer a superb alternative to professional analogue tape recorders. There seems to be no inclination to use RDAT as a long playing medium, in the manner of CDI. We see little point in considering it as a format for distributed talking books.

What is interesting, is the potential of RDAT as a mastering medium. With a 2 hour capacity, RDAT cassettes could hold masters for any of the kinds of Talking Book systems in current use. We know that many users of magnetic tape based systems are concerned about archival storage. If one was able to master on RDAT, copies could be produced without degradation. This would be a superb medium for inter library use. It wouldn't matter if the final product was on analogue tape, the quality would be as good as that coming out of the originating studio.

At RNIB, the cassette sent to a member of the Talking Book library is a third generation copy. Studio masters are made on 2 track open reel tapes which are then copied, at double speed, onto a 1" multitrack tape. This 1" tape is used on the high speed duplicators to produce the final cassettes. In the case of inter library exchange, copies are made direct from our 1/4" masters and are therefore second generation. Despite the use of fully professional equipment, this situation is far from ideal.

If the predictions that RDAT professional recorders will undercut the equivalent analogue hardware prices are true, it is a medium well worth consideration for mastering.

Other Systems

For one reason or another, none of the other systems mentioned offer any serious prospects at present.

Footnote

It is difficult to make any firm commitment to radical new technology when changes occur so rapidly. Although one naturally wants to see a viable product before deciding on change, some degree of development is inevitable, as by its nature, one can't walk into a shop and buy a new Talking Book system off the shelf. Opinions that were held a few months ago have been considerably modified as a result of subsequent developments. It is comforting to know that if none of the new options presented turn out to be practical, there is always conventional tape media to fall back on.

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Friedlander, C
The use of
alternative media
for talking books